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Report of the individual review of the annual submission of Bulgaria submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Bulgaria, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 9 to 14 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Anke Herold (Germany) and Mr. Tinus Pulles (Netherlands); energy – Mr. Ali Can (Turkey), Mr. Ioannis Sempos (Greece), Ms. Rianne Dröge (Netherlands) and Mr. Takashi Morimoto (Japan); industrial processes and solvent and other product use – Ms. Emilija Poposka (the former Yugoslav Republic of Macedonia), Mr. Kakhaberi Mdivani (Georgia) and Mr. Koen Smekens (Belgium); agriculture – Mr. Amnat Chidthaisong (Thailand) and Mr. Steen Gyldenkærne (Denmark); land use, land-use change and forestry (LULUCF) – Mr. Kumeh Assaf (Liberia), Mr. Matthew Searson (Australia) and Mr. Valentin Bellassen (France); and waste – Mr. Gabor Kis-Kovacs (Hungary) and Ms. Sirintornthep Towprayoon (Thailand). Mr. Smekens and Ms. Towprayoon were the lead reviewers. The review was coordinated by Ms. Lisa Hanle (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Bulgaria, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Bulgaria was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Bulgaria was carbon dioxide (CO_2), accounting for 80.5 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (11.6 per cent) and nitrous oxide (N_2O) (7.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.6 per cent of the overall GHG emissions in the country. The energy sector accounted for 78.9 per cent of total GHG emissions, followed by the agriculture sector (9.3 per cent), the industrial processes sector (6.0 per cent), the waste sector (5.7 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 66,133.29 Gg CO_2 eq and decreased by 45.8 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1988 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

5. Additional background data on recalculations by Bulgaria in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year[a] to 2011

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A sources		CO_2	90 092.25	80 231.67	58 043.16	45 522.77	53 760.94	45 453.85	47 770.50	53 243.42	–40.9
		CH_4	17 259.40	16 969.21	10 997.60	8 532.67	7 729.04	7 361.11	7 360.55	7 682.83	–55.5
		N_2O	14 581.33	12 336.13	6 790.46	5 420.55	5 128.04	4 639.86	4 847.37	4 796.38	–67.1
		HFCs	2.39	NA, NO	2.39	17.95	315.05	340.36	360.88	395.74	16 468.3
		PFCs	IE, NA, NO	NA, NO	IE, NA, NO	IE, NA, NO	0.00	0.01	0.04	0.05	NA
		SF_6	5.13	3.87	5.13	6.80	9.60	9.97	13.07	14.87	189.8
KP-LULUCF	Article 3.3[b]	CO_2					–276.62	–484.75	–586.59	–782.43	
		CH_4					NO	NO	NO	NO	
		N_2O					NO	NO	NO	NO	
	Article 3.4[c]	CO_2	NA				NA	NA	NA	NA	NA
		CH_4	NA				NA	NA	NA	NA	NA
		N_2O	NA				NA	NA	NA	NA	NA

Abbreviations: IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1988 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1988. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2011

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A		Energy	83 081.24	75 529.27	53 029.72	42 350.76	50 677.36	44 593.46	46 741.63	52 203.74	–37.2
		Industrial processes	11 964.01	8 846.52	9 421.59	6 234.58	5 972.47	3 210.07	3 563.08	3 977.93	–66.8
		Solvent and other product use	899.79	897.75	95.61	68.40	51.10	47.84	45.78	41.29	–95.4
		Agriculture	20 206.36	18 198.35	8 209.03	6 237.32	6 186.88	5 986.25	6 185.58	6 148.50	–69.6
		Waste	5 789.11	6 069.00	5 082.79	4 609.69	4 054.87	3 967.56	3 816.33	3 761.83	–35.0
		LULUCF	NA	–14 048.81	–13 177.57	–8 918.24	–8 281.14	–8 388.63	–8 109.04	–7 979.42	NA
		Total (with LULUCF)	**NA**	**95 492.07**	**62 661.17**	**50 582.51**	**58 661.54**	**49 416.54**	**52 243.36**	**58 153.88**	**NA**
		Total (without LULUCF)	**121 940.51**	**109 540.89**	**75 838.74**	**59 500.75**	**66 942.68**	**57 805.17**	**60 352.40**	**66 133.29**	**–45.8**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation					–586.59	–650.05	–801.36	–962.27	
		Deforestation					309.97	165.30	214.77	179.83	
		Total (3.3)					**–276.62**	**–484.75**	**–586.59**	**–782.43**	
	Article 3.4[d]	Forest management									
		Cropland management	NA				NA	NA	NA	NA	NA
		Grazing land management	NA				NA	NA	NA	NA	NA
		Revegetation	NA				NA	NA	NA	NA	NA
		Total (3.4)	**NA**				**NA**	**NA**	**NA**	**NA**	**NA**

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1988 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1988. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013; it contains a complete set of common reporting format (CRF) tables for the period 1988–2011 and an NIR. Bulgaria also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2013. The annual submission was submitted in accordance with decision 15/CMP.1. Bulgaria submitted revised CRF tables and the revised NIR on 18 May 2013.

7. Bulgaria officially submitted revised emission estimates on 4 October 2013 in response to the list of potential problems and further questions raised by the ERT (see para. 35 below). All values in this report are based on the submission of revised estimates on 4 October 2013.

8. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

9. Table 3 contains the ERT's overall assessment of the annual submission of Bulgaria. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		The Party completed the time series of emissions from navigation in the 2013 annual submission
		Notation keys are consistently used in sectoral and background tables; some incorrect notation keys were corrected in the 2013 annual submission. Incorrect notation keys remain (see paras. 40 and 46 below)
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: "NE" is reported for CO_2 emissions from hydrogen production
Land use, land-use change and forestry[a]	Complete	Mandatory: none
		Non-mandatory: "NE" is reported for CO_2 emissions and removals from settlements remaining settlements and for CO_2 emissions and removals from harvested wood products. CO_2 emissions and removals from land converted to wetlands are not reported for the period 1990–2000

		General findings and recommendations
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Not completely consistent for all categories	There is a lack of transparency of recalculations because CRF table 8(b) is not complete for all categories where recalculations occurred. Descriptions of recalculations in chapter 10 of the NIR are general and not complete compared with the recalculations undertaken (e.g. there are significant recalculations for CO_2 emissions from chemical industry and CH_4 emissions from solid waste disposal on land which are not included in table 232 in chapter 10 of the NIR). These recalculations are described in the category sections of the NIR. The ERT recommends that Bulgaria report consistent and complete information on recalculations in chapter 10 of the NIR and also complete CRF table 8(b) for all recalculations The ERT identified several categories for which the time series are not consistent in the energy, agriculture and LULUCF sectors (see paras. 37, 71, 76 and 77 below)
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Not sufficient	The relationship between quality assurance (QA) checks and planned improvements is not clear in the NIR and the ERT recommends that Bulgaria describe any improvements and recalculations arising from category-specific QA checks The ERT identified a number of areas with inconsistent data in the CRF tables compared with the NIR, errors that could be prevented by increased quality control (QC) activities (see paras. 40, 57, 58, 59, 65 and 82 below) as well as inconsistencies within the NIR (see para. 65 below). The ERT recommends that Bulgaria enhance the QC checks that assess the consistency of information between the CRF tables and the NIR
The ERT's findings on the transparency of the 2013 annual submission	Not sufficient	The ERT identified several areas where transparency of information should be improved in all sectors, except LULUCF (see paras. 12, 24, 29, 31, 41, 60 and 89 below)

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CRF = common reporting format, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

10. The NIR and additional information provided by the Party during the review described the national system for the preparation of the inventory. The Ministry of Environment and Water (MoEW) has overall responsibility for the national inventory, and

the Executive Environment Agency (ExEA), which is under MoEW, is the designated single national entity with overall responsibility for the national inventory. ExEA has managed the Bulgarian national system since 2008, and its specific responsibilities include: choice of methodology; collection of activity data (AD) and emission factors (EFs); inventory preparation, including the calculation of emission estimates; preparation of the CRF tables and the NIR and the coordination of the supporting activities of external consultants; coordinating quality assurance/quality control (QA/QC) activities; and archiving. Other government departments and agencies, institutions and organizations are also involved in the planning and preparation of the inventory, including the Ministry of Agriculture and Food (MAF), the Ministry of Economy and Energy and the Ministry of Interior/Road Control Department.

11. Agreements were signed in 2010 between MoEW and other governmental organizations regarding data acquisition. These agreements aim to ensure that data are received from the main data providers, which include: MAF and its relevant services (Agrostatistics Directorate and Executive Forestry Agency); the Ministry of Economy and Energy; the Ministry of Interior; the Ministry of Transport, Information Technologies and Communications; and the National Statistics Institute. In the NIR, Bulgaria provided information regarding the contracts with external consultants, which include: Denkstatt Ltd (for the preparation of the parts of the inventory concerning the energy sector and fluorinated gases (F-gases) from the industrial processes sector); the University of Chemical Technology and Metallurgy (for the preparation of the parts of the inventory concerning wastewater handling under the waste sector); and the University of Forestry (for the provision of KP-LULUCF AD).

12. The NIR noted that branch business associations and large industrial plants are part of the institutional arrangements of the national system. However, the information on their specific role in providing data or other input is not clearly described in the NIR; for example, it is not clear with which categories or sectors of the national system these business organizations are concerned. In response to questions raised by the ERT during the review, additional information was provided that clarifies these roles and responsibilities. The ERT recommends that Bulgaria provide additional information on the roles of large industrial plants and business associations in the description of the national system.

13. Following recommendations made in the previous review report, Bulgaria has used data provided by installations under the European Union emissions trading system (EU ETS) for the verification of its reported emissions as well as a data source for higher-tier estimation approaches. As the scope of the EU ETS extends to additional activities from 2013 onwards, the ERT encourages Bulgaria to use the reports of verified emissions from installations covered under the revised scope, which are to become available in 2014, for further verification activities, for example for the emissions from chemical industry, and to include such verification activity in its improvement plan for 2014.

Inventory preparation

14. Table 4 contains the ERT's assessment of Bulgaria's inventory preparation process.

Table 4
Assessment of inventory preparation by Bulgaria

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good*	Yes	Bulgaria implemented improvements related to the reporting of key

		General findings and recommendations
Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?		categories and reported a summary table in the NIR
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	No	
Has Bulgaria identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does Bulgaria use the key category analysis to prioritize inventory improvements?	Yes	The priorities in the improvement plan of Bulgaria reflect the requirements of the compliance action plan (see para. 18 below) and the annual review reports and the ERT therefore concludes that the importance of key categories is adequately taken into account
Are there any changes to the key category analysis in the latest submission?	No	
Assessment of uncertainty analysis		
Approach followed?	Both tier 1 and tier 2	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Uncertainties for AD in some sectors seem to be low (e.g. for road transportation, where Bulgaria uses AD for the car fleet from other countries, but assumes an uncertainty of 3.0%). In the agriculture sector, the uncertainty is 2.0% which seems low given the combination of different activities and uncertainties related to the attribution of animals to different animal waste management systems. The ERT recommends that Bulgaria check the AD uncertainties currently assumed in the estimation (e.g. by comparing with some other countries and revise the assumed uncertainties as appropriate) Domestic navigation is not included in

	General findings and recommendations
	the uncertainty assessment
Quantitative uncertainty (including LULUCF)	Level = 30.8%
	Trend = 6.8%
Quantitative uncertainty (excluding LULUCF)	Level = 13.4%
	Trend = 4.2%

Abbreviations: AD = activity data, CRF = common reporting format, ERT = expert review team, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

15. The NIR reports that Bulgaria has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The NIR indicates that the archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The archive is managed by ExEA, and has back-up and disaster recovery systems in place for the electronic file storage to ensure robustness and continuity. During the review, the ERT was provided with the requested additional archived information.

4. Follow-up to previous reviews

16. In the 2013 annual submission, Bulgaria has implemented the following improvements:

(a) The weighted average of country-specific EFs for fuels in the energy sector was recalculated and the EF for other bituminous coal was revised;

(b) The estimation methodology for emissions from iron and steel production was revised to remove the double counting between the energy and industrial processes sectors;

(c) Emissions from civil aviation were calculated based on landing/take offs (LTOs) data provided by Eurocontrol for the time series;

(d) EFs for fugitive emissions from surface mines and natural gas transmission were recalculated;

(e) For ammonia production, the natural gas consumption for fuel combustion and non-energy use was clarified and double counting removed;

(f) AD for the use of emissions from metered dose inhalers (MDI) were obtained and replaced previous assumptions and extrapolations;

(g) Emissions from poultry manure have been recalculated for the entire time series because country-specific data for the amount of nitrogen (N) excreted and for animal waste management systems (AWMS) distribution systems were collected;

(h) The area of forest land has been recalculated for the entire time series taking into account the results of a project implemented as part of the ongoing Bulgarian improvement process for reporting the supplementary information under Article 3, paragraph 3, of the Kyoto Protocol;

(i) A summary table of key categories was provided.

17. In the 2013 annual submission, Bulgaria has not yet implemented the following recommendations made in the 2011 annual review report:

(a) Removal of discrepancies between the NIR and the CRF tables;

(b) Reporting more transparent information on category-specific recalculations performed in chapter 10 of the NIR and CRF table 8(b);

(c) Comparison between the tier 1 and tier 3 methodologies in road transportation;

(d) Provision of the rationale behind the split of lignite production between surface mining and underground mining;

(e) Correction of the apparent fuel consumption in the reference approach excluding non-energy use of fuels;

(f) The use of country-specific values for the fraction of carbon stored instead of default values (see para. 27 below);

(g) Reallocation of emissions from residual fuel oil from the heating of railway buildings in the energy sector from the subcategory railways to the category commercial/institutional (see para. 28 below);

(h) Improvement in the transparency of the description of methods in the industrial processes sector (see para. 39 below);

(i) Inclusion of a more detailed description for the calculation of actual emissions from foam blowing in the NIR and deduction of emissions from exported foams (see para. 50 below);

(j) Generation of appropriate country-specific values of volatile solids (VS) (see para. 66 below) and the methane conversion factor (MCF) for cattle and sheep;

(k) Use of country-specific parameters to estimate N_2O emissions from ammonia volatilization and report these emissions under the indirect soil emissions category (see para. 67 below);

(l) Inclusion of information on the amount, composition and treatment of industrial waste in solid waste disposal (see para. 84 below).

18. With the 2013 annual submission, the implementation of the compliance action plan (CC-2010-1-17/Bulgaria/EB) is still ongoing and the planned activities extend until the 2014 annual submission. Bulgaria provides documentation of the status of the implementation of the compliance action plan in its NIR and the activities planned for the 2013 annual submission have been implemented, such as:

(a) The continued training and capacity-building of staff;

(b) The support of external auditors for improvement of QA procedures;

(c) Improvement of the estimation method for iron and steel;

(d) Improvements in land-use classifications and representation;

(e) Estimation of CH_4 emissions from composting activities;

(f) Improvements in some subcategories of the consumption of halocarbons and SF_6;

(g) Implementation of tier 2 methods for cattle and sheep for enteric fermentation and manure management.

19. The documentation in the NIR (table 235) also shows that Bulgaria was not able to collect AD for N_2O emissions from aerosol cans as planned for the 2013 annual submission.

5. Areas for further improvement identified by the expert review team

20. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 8.

B. Energy

1. Sector overview

21. The energy sector is the main sector in the GHG inventory of Bulgaria. In 2011, emissions from the energy sector amounted to 52,203.74 Gg CO_2 eq, or 78.9 per cent of total GHG emissions. Since 1988, emissions have decreased by 37.2 per cent. The key driver for the fall in emissions is the shift from a planned to a market economy in 1988–1989, leading to a sharp decrease in electricity demand from thermal generation and a correspondingly large emission reduction. An internal political crisis in 1996–1997, resulting in an economic downturn, caused emissions to decrease further. These changes were largely reflected in stationary combustion, particularly in energy industries and manufacturing industries and construction. Within the sector, 69.7 per cent of the emissions were from energy industries, followed by 15.6 per cent from transport, 7.0 per cent from manufacturing industries and construction and 4.4 per cent from other sectors (fuel combustion). Fugitive emissions from solid fuels accounted for 2.0 per cent and fugitive emissions from oil and natural gas accounted for 1.3 per cent of energy sector emissions.

2. Reference and sectoral approaches

22. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 23–27 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references
Difference between the reference approach and the sectoral approach	Energy consumption: 30.72 PJ, 5.38% CO_2 emissions: 1,551.29 Gg CO_2 eq, 3.11%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	23–24
Are differences with international statistics adequately explained?	Yes	
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	

Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	26, 27

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

23. The ERT noted that the difference in CO_2 emissions between the reference and the sectoral approaches is more than 2.0 per cent. The NIR indicates that the difference can be explained by the emissions from non-energy use of fuels, which are reported in the industrial processes sector. Furthermore, it can be explained by statistical differences and losses. In response to questions raised by the ERT during the review as to whether these reasons for differences in the data could be quantified, Bulgaria was unable to prepare an estimate during the review week. The ERT expects that the reasons provided by Bulgaria could be used to explain the differences between the reference and the sectoral approaches, and that quantifying these differences and presenting the results in the NIR will increase the transparency. The ERT recommends that Bulgaria include a quantitative explanation of the differences between the two approaches in the NIR.

24. The previous review report recommended that Bulgaria correct the value reported for apparent consumption (excluding non-energy use of fuels), because it was actually the value including the fuel quantities used for non-energy uses and feedstocks. Excluding the non-energy use of fuels will explain part of the difference between the reference and the sectoral approaches. In response to a question raised by the ERT during the review, Bulgaria indicated that it plans to correct the apparent consumption to exclude fuel quantities used for non-energy uses and feedstocks in the 2014 annual submission. The ERT recommends that Bulgaria include this correction and describe the impact of this change on the differences between the sectoral and the reference approaches (see para. 23 above).

International bunker fuels

25. No problems were identified.

Feedstocks and non-energy use of fuels

26. Bulgaria recalculated the feedstocks of natural gas based on ammonia production statistics. The remaining quantities of natural gas were considered as energy consumption and accounted for in the subcategory chemicals. In response to a question raised by the ERT during the review, Bulgaria indicated that the revision of the national energy balance is still pending, but the recalculated feedstocks are used in the CRF tables. Bulgaria also indicated that an error occurred when inputting the data into the CRF Reporter and provided the correct non-energy use of natural gas during the review. The ERT recommends that Bulgaria correct this error in reporting the non-energy use of natural gas.

27. The previous review report indicated that, for the reference approach calculations, Bulgaria used default values from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) to estimate the fraction of carbon stored in the non-energy use of fuels, while Bulgaria also has country-specific data available concerning the actual non-energy use of fuels. In response to a question raised by the ERT during the review, Bulgaria indicated that the use of country-specific fractions of carbon stored is particularly important for natural gas, because the default fraction of carbon stored does not reflect the national situation. Bulgaria indicated that it plans to change the fraction of carbon stored in the next annual submission.

The ERT encourages Bulgaria to use the country-specific fractions of carbon stored in the reference approach calculations and to use them for explaining the differences between the reference and the sectoral approaches.

3. Key categories

Stationary combustion: liquid fuels – CO_2, CH_4 and N_2O[3]

28. Bulgaria has reported the emissions from residual fuel oil from the heating of railway buildings in the subcategory railways. According to the Revised 1996 IPCC Guidelines, these emissions should be reported in commercial/institutional. The previous review report recommended that Bulgaria reallocate these emissions to the appropriate subcategory. In response to a question raised by the ERT during the review, Bulgaria indicated that these emissions have not been reallocated in order to be consistent with the energy balance, but it plans to reallocate them in the next annual submission. The ERT reiterates the recommendation made in the previous review report that Bulgaria reallocate the AD and emissions from residual fuel oil in the railways subcategory to the category commercial/institutional for the entire time series.

29. Bulgaria has reported the emissions from military consumption of gasoline and diesel oil in the category road transportation and the emissions from military consumption of jet kerosene under civil aviation. According to the Revised 1996 IPCC Guidelines, these emissions should be reported in the category other (energy). The previous review report recommended that Bulgaria reallocate these emissions. In response to a question raised by the ERT during the review, Bulgaria indicated that these emissions have not been reallocated due to confidentiality issues. According to the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), if data on a fuel split are unavailable, all the fuel sold for military activities should be treated as domestic. The ERT recommends that Bulgaria change the notation key for liquid fuels under other (energy – mobile) from "NO" (not occurring) to "IE" (included elsewhere) and report in the NIR that emissions from military activities are treated as domestic and included in road transportation and civil aviation.

Stationary combustion: solid fuels – CO_2

30. Following a recommendation made in the previous review report, Bulgaria explored the possibility of obtaining a correlation between the carbon content and the net calorific value (NCV) of anthracite, lignite, other bituminous coal and sub-bituminous coal. The NIR indicates that there was a very low correlation between the carbon content and the NCV, due to the fact that the number of samples is relatively low and the coal is both imported and produced locally. In response to a question raised by the ERT during the review, Bulgaria provided it with the data on the correlation. Based on the correlation assessment, the ERT concurs that a satisfactory correlation cannot be obtained based on the EU ETS data, and these data can therefore not be used to derive a time series of CO_2 EFs for 1988–2006. The ERT commends Bulgaria for assessing the correlation and agrees with the Party's decision to continue using weighted average EFs from the period 2007–2011 for 1988–2006.

Road transportation: liquid fuels – CO_2

31. The ERT noted that the fuel consumption in the CRF tables for road transportation differs from the national energy balance (diesel: –0.2 per cent; gasoline: –0.5 per cent;

[3] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

liquefied petroleum gas (LPG): +1.2 per cent). In response to a question raised by the ERT during the review, Bulgaria indicated that the COPERT model is run twice; once with actual vehicle numbers and mean European mileage per vehicle, and a second time to scale the resulting fuel consumption to the fuel consumption in the energy balance. Bulgaria further indicated that it unintentionally used the COPERT default NCVs, instead of the country-specific NCVs, which should be the main reason for the difference. Bulgaria explained that this does not influence the calculated emissions, but only the AD and the implied emission factor (IEF). The ERT recommends that Bulgaria correct the AD and explain any remaining differences in the NIR.

32. The ERT noted that the CO_2 EF for gasoline in road transportation decreases from 72.09 t/TJ to 70.99 t/TJ between 1988 and 2011 (–1.5 per cent). In response to a request by the ERT during the review to describe the rationale for such a change, Bulgaria described how it had conducted a test run of the COPERT model to corroborate the IEF. Bulgaria input equal values for each vehicle type and mileage (e.g. 1,000 vehicles driven 1,000 km/year) and kept all other parameters the same as those from the official submission. This resulted in a very stable IEF, suggesting that the IEF is only marginally influenced by input factors that change annually (e.g. temperature) and that vehicle fleet evolution is causing the decreasing trend in the emissions. The default H/C (hydrogen/carbon) and O/C (oxygen/carbon) ratios provided in COPERT for leaded and unleaded gasoline are used by Bulgaria, although it is advised to use country-specific data. These default H/C and O/C ratios (combined with the default COPERT NCV) result in CO_2 EFs of 72.09 kg/TJ for leaded gasoline and 70.94 kg/TJ for unleaded gasoline. The decreasing trend in CO_2 EFs is a result of the shift from leaded gasoline to unleaded gasoline. However, Bulgaria indicated in the NIR that leaded gasoline has not been used since 2004. This would result in an EF of 70.94 kg/TJ for the years from 2004 onward, instead of the reported CO_2 EF of 70.98–71.12 kg/TJ for these years. The ERT recommends that the Party investigate whether the default H/C and O/C ratio are suitable for Bulgaria and recalculate the split between leaded and unleaded gasoline.

33. Bulgaria has reported that one of the category-specific planned improvements is an investigation of the country-specific parameters used in COPERT concerning the car fleet and vehicle split (NIR paragraph 3.3.12.3.9). The NIR indicates that the technology split is adopted from Slovakia, but in response to a question raised by the ERT during the review, Bulgaria indicated that the technology split is adopted from Slovenia (and that only the driving share split was adopted from Slovakia). The ERT recommends that Bulgaria undertake its plan to investigate the country-specific parameters concerning the car fleet and vehicle split and implement them in the COPERT model.

Coal mining and handling: solid fuels – CH_4

34. Bulgaria has used a tier 1 methodology and default EFs from the IPCC good practice guidance for surface mining and the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for underground mining to calculate the CH_4 emissions from coal mining and handling. This category is a key category and therefore it is good practice to use a higher-tier method to estimate emissions. In response to questions raised during previous reviews, Bulgaria indicated that moving to a higher-tier method would require significant financial and human resources. Bulgaria indicated that it would assess the required resources and include this improvement in its improvement programme. The ERT notes, however, that Bulgaria has not included any planned improvements for this category. The ERT therefore recommends that Bulgaria include the use of a higher-tier method for coal mining and handling in its improvement plan and implement this improvement in a future annual submission. The ERT also recommends that Bulgaria include further information in the NIR about whether and when

its assessment of resources allows it to move to a higher-tier method for this category in a future annual submission.

Oil and natural gas: liquid fuels – CO_2 and CH_4

35. Bulgaria has reported "NO" for oil transport in CRF table 1.B.2. Since oil is produced and refined in Bulgaria, it is expected that oil is transported. In response to a question raised by the ERT during the review regarding oil transport, Bulgaria explained that the previous ERT advised it that the main source of emissions from this category occurs when crude oil is loaded onto tanker ships. Since this activity does not occur in the country it was reported as "NO". During the review week, Bulgaria discussed this with the oil extraction company, who informed it that oil is transported to the refinery by ADR[4] trucks. As a methodology for estimating CO_2 and CH_4 emissions from oil transport by tanker trucks is available in the IPCC good practice guidance, emissions should be estimated. The ERT considered that this was a potential underestimation of emissions and included this issue in the list of potential problems and further questions raised by the ERT during the review. In response, Bulgaria submitted emission estimates for the entire time series. The estimates were prepared using the EF from the IPCC good practice guidance (25 kg CH_4/1000 m^3 and 2.3 kg CO_2/1000 m^3), which led to an increase in emissions of 0.0135 Gg CO_2 eq for 2011 and a 0.3 per cent increase in fugitive emissions (oil). The ERT agreed with these estimates and recommends that Bulgaria include the methodological description of this category in the NIR.

4. Non-key categories

Stationary combustion: other fuels – CH_4 and N_2O

36. The ERT noted that Bulgaria reported IEFs for CH_4 and N_2O for other fuels in the subcategory other (manufacturing industries and construction) in CRF table 1.A (78.22 kg/TJ for CH_4 and 10.43 kg/TJ for N_2O) that were higher than the EFs calculated using the data reported in NIR tables 30 and 31, which are based on the Revised 1996 IPCC Guidelines (30.0 kg/TJ for CH_4 and 4.0 kg/TJ for N_2O). In response to a question raised by the ERT during the review, Bulgaria provided a table indicating the fossil and biomass fractions of the fuels allocated under other fuels. The fuel consumption data and the CO_2 emissions refer to the fossil fraction only, while the CH_4 and N_2O emissions have been calculated based on both the fossil and the biomass fractions of the fuel (leading to a higher IEF for CH_4 and N_2O). For transparency, the ERT recommends that Bulgaria split the AD for other fuels into a biomass fraction (allocated under biomass) and a fossil fraction (allocated under other fuels).

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

37. Bulgaria has reported that emissions from civil aviation have been recalculated using a tier 2 methodology in its NIR (paragraph 3.3.12.2). For the years 1998–2011, the emissions have been calculated using a tier 2 methodology and for the years 1988–1997, the emissions have been calculated using a tier 1 methodology. In response to a question raised by the ERT during the review, Bulgaria indicated that the difference in CO_2 equivalents between the tier 1 and the tier 2 methodologies is on average 0.3 per cent and therefore this provides a consistent time series. The ERT commends Bulgaria for the use of a higher-tier methodology for civil aviation and encourages Bulgaria to investigate the possibilities of deriving a consistent time series (e.g. by using the comparison between the two methods and proportionally adjusting the previously developed emission estimates).

[4] ADR is the acronym given to the European Agreement Concerning the International Carriage of Dangerous Goods by Road.

C. Industrial processes and solvent and other product use

1. Sector overview

38. In 2011, emissions from the industrial processes sector amounted to 3,977.93 Gg CO_2 eq, or 6.0 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 41.29 Gg CO_2 eq, or 0.1per cent of total GHG emissions. Since the base year, emissions have decreased by 66.8 per cent in the industrial processes sector, and decreased by 95.4 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector is a general reduction in industrial activities across all categories (except for consumption of halocarbons and SF_6) resulting from the economic crises of 1989–1990, 1997–1998 and 2009. During 2011 there was a slight increase in emissions of 11.6 per cent, mainly due to increased industrial activity. Within the industrial processes sector in 2011, 68.4 per cent of the emissions were from mineral industry, followed by 19.6 per cent from chemical industry and 10.3 per cent from consumption of halocarbons and SF_6. The remaining 1.7 per cent was from metal production.

39. The ERT notes that Bulgaria has not included a fully transparent description of the methods (e.g. equations for the F-gases emissions calculations) and non-confidential country-specific parameters (e.g. cement, lime and ferroalloy types) used, and has omitted chapters in the NIR for specific categories (e.g. CH_4 emissions from ethylene, dichloroethylene, styrene and methanol production). The ERT reiterates the recommendation made in the previous review report that Bulgaria revise the chapter on industrial processes in the NIR to ensure that it provides the level of information necessary to understand the basis and rationale behind the emission estimates.

40. The ERT commends Bulgaria for its effort to improve the consistency between the NIR and the CRF tables. However, the ERT encountered incorrect usage of notation keys (e.g. CO_2 emissions from coke production are reported as "NO" in the CRF tables but should be reported as "IE" since they are included in the energy sector), inconsistency between the NIR and the CRF tables (e.g. AD and the IEF for coke production are reported as confidential in the CRF tables for 1988–2008 but these data are included in the NIR) and inconsistencies within the text in the NIR (e.g. Bulgaria states that it uses an average default EF for emissions from ferroalloy production (2.4 t CO_2/t ferroalloys) but in the CRF tables the EF is labelled confidential). The ERT reiterates the recommendation made in the previous review report that Bulgaria strengthen its QC activities to ensure that the information included in the NIR is consistent with the data reported in the CRF tables and review, and as appropriate revise, the usage of the notation keys in the industrial processes sector.

2. Key categories

Lime production – CO_2

41. According to the NIR, Bulgaria has included the total amount of lime produced using data from the national statistics, but did not disaggregate these data per lime type (i.e. quicklime and dolomitic lime). In response to a question raised by the ERT during the review, Bulgaria provided a spreadsheet with disaggregated data obtained from national statistics for the period 1988–1998 and estimated the total amount of lime produced, by type, as recommended in the previous review report for the period 1998–2008. However, it is not transparently described in the NIR which method was used to calculate the ratio between the quicklime and dolomitic lime for the period 1998–2008. The ERT reiterates the recommendation made in the previous review report that Bulgaria provide the method and source used for estimating the ratio between quicklime and dolomitic lime production in the NIR.

42. In the NIR, Bulgaria has explained that in 2008, the largest metallurgical plants ceased operation and virtually no more dolomitic lime was produced. In 2012, Bulgaria sent letters to the four lime production plants questioning the type of lime produced and all indicated that they had not produced dolomitic lime in the period 2009–2011. With these new findings Bulgaria recalculated the IEF for this period and thus improved the accuracy of the emission estimates. The ERT commends Bulgaria for this effort.

Other (mineral products) – CO_2

43. For ceramics production, the ERT noted that Bulgaria has used a constant EF (0.10 t CO_2/kt ceramics produced) for the period 1988–2008. Bulgaria explained in the NIR that the EU ETS production and emissions data for 2008 were used in order to obtain this country-specific EF. The CO_2 IEF for Bulgaria significantly decreased between 2008 (0.10 t/t) and 2011 (0.05 t/t), a decrease of 126.7 per cent. During the review, in response to questions raised by the ERT, Bulgaria explained that the data for the calculation of the EF were obtained from the EU ETS reports. These reports were not available until the 2010 annual submission, where the EF for 2008 was calculated, and the higher IEF for 2008 was applied to prior years as a conservative approach to avoid an underestimation of emissions. The ERT notes that, according to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines), emissions should be accurate, in that they are not overestimated or underestimated, as far as can be judged; therefore, the ERT recommends that Bulgaria determine whether the average IEF from the newly available data from the EU ETS for the period 2009–2011 would be a more accurate reflection of emissions prior to 2008, and if so, recalculate the country-specific EF using the newly available data and apply the revised country-specific EF to the entire time series of 1988–2007.

Ammonia production – CO_2

44. The ERT noted that in the NIR Bulgaria has reported using the 2006 IPCC Guidelines for the estimation of CO_2 emissions from ammonia production. The equation from the 2006 IPCC Guidelines includes the deduction of CO_2 recovered for downstream use (i.e. urea production) from the total CO_2 emissions from ammonia production. According to the IPCC good practice guidance, these emissions should not be deducted since this carbon will be stored for only a short time and subtracting these emissions would lead to an underestimation of total emissions if they are not reported elsewhere. In response to questions raised by the ERT during the review, Bulgaria replied that the recovered carbon is considered to be zero. To improve transparency and consistency with the UNFCCC reporting guidelines, the ERT recommends that Bulgaria clearly explain in the NIR that it uses the equation for CO_2 emissions estimation from the Revised 1996 IPCC Guidelines and does not deduct the CO_2 used for urea production.

Iron and steel production – CO_2

45. Bulgaria has reported CO_2 emissions from basic oxygen furnace (BOF) steel making from 1990–2008 (production in BOF ceased in November 2008). According to the NIR (page 238), Bulgaria recalculated emissions from BOFs for the 2013 annual submission by applying a default EF factor of 1.46 t C/t steel produced from the 2006 IPCC Guidelines and subtracting emissions from coke production from the energy sector with a view to avoiding possible double counting of emissions. In response to a draft version of this report, Bulgaria indicated that the data provided in the NIR are incorrect and that the Party is using a country-specific EF (varying from 1.4–1.9 t C/t steel production) based on a mass balance approach, considering all input raw fuels and materials. The ERT noted that there is lack of transparency in the NIR and inconsistency between the NIR and the information reported in the CRF table. Since the data and the methodologies used for the calculation of the country-

specific EF were not provided during the review, the ERT was unable to verify the method used. The ERT recommends that Bulgaria document the data and the methodologies used for the calculation of the country-specific EF in the NIR, including a carbon balance.

46. The ERT noted that Bulgaria reported "NO" for CO_2 emissions from pig iron and coke production. The ERT noted that this is an incorrect usage of notation keys since Bulgaria, in order to avoid double counting, reported CO_2 emissions from pig iron production under steel production in the industrial processes sector and coke production under manufacture of solid fuels and other energy industries in the energy sector. The ERT recommends that Bulgaria use the notation key "IE" for these subcategories.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

47. Bulgaria has used methods that are generally in line with the IPCC good practice guidance for estimating emissions from consumption of halocarbons. The ERT noted that, in the NIR, Bulgaria reported on improvements made to the AD used for the estimates by:

(a) Recalculating the AD for stationary air conditioning by using actual data based on market prices for a single air-conditioning unit as opposed to the previously used extrapolation of the number of goods and services;

(b) Revising the AD for the period 2005–2010 for quantities of HFC-152a and HFC-134a used in manufacturing of extruded polystyrene insulation foams, solid polyurethane foams and one component foams by obtaining data from the annual reports of the Regional Inspectorate of Environment and Water and via questionnaires;

(c) Replacing extrapolated data based on foreign data and information sources for the import and usage of MDIs, with actual data obtained by direct communication with the operators and importers of MDIs.

48. The ERT commends Bulgaria for this effort and encourages the Party to continue its work towards more accurate data collection.

49. Bulgaria has reported actual emissions from disposal for the following subcategories: domestic refrigeration (HFC-134a); transport refrigeration (HFC-134a, HFC-125, HFC-32 and HFC-143a) and mobile air conditioning (HFC-134a). The ERT noted that the Party calculated the emissions from disposal as a 100 per cent loss of the total amount of gas charged in the systems without deducting the loss of the gas during the lifetime of the systems. In response to questions raised by the ERT during the review, Bulgaria explained that this method was considered as a conservative approach to avoid underestimation of emissions. The ERT notes that, according to the UNFCCC reporting guidelines, emissions should be accurate, in that they are not overestimated or underestimated, as far as can be judged, and recommends that Bulgaria correct the calculation method of HFC emissions from refrigeration and air-conditioning system disposal by deducting the gas losses during the lifetime of the systems.

50. Bulgaria has reported HFC-134a and HFC-152a emissions from the usage of these gases in foams manufacturing for the period 2005–2011. Bulgaria has estimated potential and actual emissions from this activity. However, in the NIR, the Party did not explain the methodology, parameters and assumptions used for the calculation of these emissions. The ERT recommends that Bulgaria include a more detailed description for the calculation of actual emissions from foam blowing in the corresponding chapter in the NIR. The ERT also noted that Bulgaria did not include the emissions from the imported foams nor did it deduct the emissions from exported foams, as raised in recommendations made in the previous two review reports. The ERT reiterates the recommendation made in the previous review reports that Bulgaria account for the imported and exported foams in order to improve the accuracy of the inventory.

51. Bulgaria has reported actual and potential emissions of SF_6 from its use as an insulating medium in electrical equipment. However, in the NIR, the Party did not explain the methodology, parameters and assumptions used for the calculation of the actual emissions, and did not include data sources for the AD. In response to a question raised by the ERT during the review, Bulgaria explained that the data for the amount of SF_6 used were obtained directly via communication with the operators, who provided EFs for different equipment types. The ERT recommends that Bulgaria include these data and a detailed explanation about the emission calculation methods used in a separate section of the NIR.

3. Non-key categories

Carbide production – CO_2

52. Bulgaria has estimated CO_2 emissions from carbide production using a tier 1 method from the Revised 1996 IPCC Guidelines. Bulgaria uses anthracite as a reducing agent in the process of carbide production and a default EF of 1.09 t CO_2/t carbide for the reduction process. However, as confirmed by the Party in response to a question raised by the ERT during the review, Bulgaria does not deduct this amount of anthracite from the energy sector. The ERT recommends that Bulgaria investigate the quantity of anthracite used and deduct these emissions from the energy sector.

Other (chemical industry) – CH_4

53. Bulgaria has reported CH_4 emissions from other (chemical industry) for ethylene, dichloroethylene, styrene and methanol production for the period 1988–2009. Emissions from this category were not reported for the period 2010–2011. In response to a question raised by the ERT during the review, Bulgaria responded that the plant producing these substances was not operational during this period. Bulgaria did not include this category in the NIR so it is not clear which methodology and data sources were used for the calculation of the emissions between 1988 and 2009. The ERT recommends that Bulgaria include information in the NIR for this category on data sources, EFs and associated parameters, methods and assumptions to ensure that all estimates can be independently verified.

Ferroalloy production – CO_2

54. Bulgaria has calculated emissions from ferroalloy production by applying an average default EF (2.4 t CO_2/t ferroalloy) to the total ferroalloy production volume. In response to a question raised by the ERT during the review, Bulgaria provided a spreadsheet with confidential data on ferroalloy production, disaggregated by ferroalloy type. The ERT concluded that Bulgaria has sufficient data to recalculate the emission estimate for this category by applying the default EFs, by ferroalloy type, given in table 2.15 of the Revised 1996 IPCC Guidelines, thereby improving the accuracy of the inventory. The ERT encourages Bulgaria to apply default EFs based on a material balance by ferroalloy type, as given in the 1996 Revised IPCC Guidelines.

D. Agriculture

1. Sector overview

55. In 2011, emissions from the agriculture sector amounted to 6,148.50 Gg CO_2 eq, or 9.3 per cent of total GHG emissions. Since 1988, emissions have decreased by 69.6 per cent. The key drivers for the fall in emissions are a decrease in key livestock populations and crop production. Within the sector, 57.6 per cent of the emissions were from agricultural soils, followed by 21.3 per cent from enteric fermentation and 18.9 per cent from manure management. Rice cultivation accounted for 1.6 per cent and field burning of

agricultural residues accounted for 0.6 per cent of emissions. Agricultural emissions consisted of 66.5 and 33.5 per cent of N_2O and CH_4, respectively.

56. Bulgaria has made recalculations for the agriculture sector between the 2012 and 2013 annual submissions (e.g. live weight of young cattle, the nitrogen excretion rate (Nex) for poultry and modification of parameters for manure processing). However, Bulgaria did not sufficiently provide the rationales for the recalculations, or the specific methodology or parameters used in the recalculations. In response to a question raised by the ERT during the review, Bulgaria provided the explanation, data and results, and the effects of the recalculations on the emissions. The ERT strongly recommends that Bulgaria incorporate such information into the NIR for each category where recalculations occur. For the impact of the recalculations on the agriculture sector, see table 9 below.

57. There are numerous issues that have been identified in the 2013 annual submission that suggest that QA/QC could be improved. There are several inconsistencies in the data between the CRF tables and the NIR, for example:

(a) 194.63×10^3 head in CRF table 4.A versus 198.64×10^3 head in the NIR for young cattle;

(b) 137.7×10^3 head in CRF table 4.A versus 143.95×10^3 head in the NIR for mules and asses;

(c) In the NIR there is an incorrect presentation of figures (e.g. figure 76), in which, for example, the population numbers of swine and mules are much higher than those indicated in table 164 of the NIR (by two orders of magnitude);

(d) Dry matter fractions of crop residues (e.g. for potatoes a dry matter fraction of 0.15 given in CRF table 4.F but 0.45 in the NIR, among others).

58. In addition, there are internal inconsistencies within the NIR, for example:

(a) Two rows in table 157 are designated as manure management – swine – CH_4, one is labelled as IPCC category 4.B.8 and one is labelled as IPCC category 4.B.9 (the correct label is IPCC category 4.B.8);

(b) Tables mislabelled in the NIR (e.g. tables 142, 143 and 144 mentioned on pages 295–296 refer to the industrial processes sector).

59. These are just some examples of numerous inconsistencies found. A similar issue of inconsistencies was raised in the previous review report and recommendations made included that Bulgaria improve the QA/QC procedures. Based on the above-mentioned observed discrepancies, among others, the ERT reiterates the recommendation made in the previous review report that Bulgaria pay more attention to the QA/QC procedures and demonstrate that it has improved the consistency and accuracy of its GHG emissions inventory for the agriculture sector.

2. Key categories

Enteric fermentation – CH_4

60. For young cattle, Bulgaria has revised the live body weight as a result of the EU effort sharing system (ESD) technical review. In the previous annual submission, weight at slaughter instead of average body weight was applied to calculate the feed energy demand for maintenance. This recalculation, in general, resulted in a lower live weight (36 per cent lower in 1988 and 39 per cent lower in 2011) compared with those that were used in the previous annual submission. As a result, emissions decreased (11.9 per cent in 1988 and 15.1 per cent in 2010). This recalculation was not well described in the NIR. In response to questions raised by the ERT during the review regarding the finding of the technical review

that led to the recalculation, how the recalculation was conducted (e.g. AD and EFs used) and the impact on emissions, Bulgaria provided the parameters used and the resulting impacts on the emissions. The ERT recommends that Bulgaria include this detailed information on how emissions are calculated in the NIR.

61. The majority of manure (83.6 per cent) for swine is treated in an anaerobic lagoon. This situation is unique to Bulgaria; the use of anaerobic lagoons in other European countries is only a small fraction of the total AWMS. The MCF chosen for estimating CH_4 emissions in anaerobic lagoons is 90 per cent (based on the Revised 1996 IPCC Guidelines for temperate climates, as selected by Bulgaria). Considering that swine are a significant source of manure CH_4 emissions, that the majority of farm units are smallholdings, and that all animals are classified to live in cool climates where decomposition of organic matter is slow (as indicated in CRF table 4.B(a)), the use of an MCF of 90 per cent may overestimate CH_4 emissions. The ERT recommends that Bulgaria justify the use of an MCF of 90 per cent, and make efforts to develop a country-specific value. For reference, the value for the EU is around 39–40 per cent (cool climate) and 45 per cent (temperate climate).

Manure management – CH_4 and N_2O

62. Bulgaria has used country-specific data on manure production and N content of swine and cattle. However, Bulgaria has not explained how and when the manure production is measured, nor the uncertainty level associated with these values. In addition, the N contents of 4.9 kg N in 1,000 kg for cattle manure and 4.5 kg N in 1,000 kg manure for swine were used. The ERT could not find information on how these N contents were measured and whether these account for N loss due to ammonia volatilization. In response to questions raised by the ERT during the review, Bulgaria explained that data were obtained through scientific studies, including chemical analysis of the manure, with an uncertainty level of 2 per cent. N content of the manure was measured in the sample containing a mixture of dung and urine. According to the Party, the value includes the entire N quantity of the fresh manure. Data sheets and references were provided during the review. The ERT welcomes these efforts of Bulgaria to improve its CH_4 and N_2O emission estimates from manure management and recommends that details be given in the NIR.

63. The Nex for dairy cows has been kept constant for all years since 1988 (71.54 kg N/dairy cow/year). This Nex is based on the measured N content in cattle manure and a manure excretion rate of 40 kg manure per day. The default Nex for dairy cows in the IPCC good practice guidance is 70 kg/dairy cow/year for Eastern European conditions. This amount is based on a milk production of 2,800 litres/dairy cow/year. The default value for Western European conditions is 100 kg N, which is based on a milk production of 4,200 litres/dairy cow/year. The average milk production in Bulgaria is 4,300 to 4,600 litres/dairy cow/year. Although the current country-specific Nex factor for dairy cows is above the default value for Eastern European conditions, given the higher milk production, it may not be appropriate for conditions in Bulgaria. This can also be verified by comparing the manure production in a study[5] referenced in a memo provided by Bulgaria in response to questions raised by the ERT during the review (40 kg manure per day) with that reported by Bulgaria in the 2013 annual submission. In table 4.B(a), for 2011, Bulgaria has reported VS production of 5.58 kg VS/head/day. In general, about 80 per cent of the dry matter in manure VS has a dry matter content of approximately 10–12 per cent. So the manure excretion per dairy cow in Bulgaria according to table 4.B(a) is around 58–70 kg manure per day. If the country-specific manure production which is used to estimate the Nex is low, then the Nex would be low too. The ERT therefore strongly recommends that Bulgaria

[5] Study by P. Petrov et al (1983) referenced in a 2011 memo sent from D. Penko et al to Mr. Plamen Despotov (Executive Environment Agency), titled "Methodology for the calculation and determination of nitrogen from agricultural mammals (cattle, sheep and pigs) in the period 1992–2010".

verify and document the country-specific manure Nex values used in the inventory with well-documented and detailed values. This should include analysis of manure production, dry matter content, VS content and N content for a number of animals housed in different stable types and with different productivity (e.g. high milk-producing, low milk-producing and dry cows) and for all cattle categories. If this is not possible then the ERT recommends that Bulgaria use the default Western European Nex value of 100 kg N/dairy cow/day.

64. In connection with the lack of transparency in the manure excretion rates for cattle as mentioned above, the ERT recommends that Bulgaria further investigate manure production from pigs and subsequently the Nex values for pigs, as these were provided in the same memo described in paragraph 63 above and thus have the same lack of transparency as those for cattle.

65. The Nex for poultry was changed from 0.6 kg N/head/year in the 2012 annual submission (based on the Revised 1996 IPCC Guidelines) to a country-specific value of 0.93 kg N/head/year in the 2013 annual submission. The AWMS allocation for poultry manure as indicated in the NIR was also changed to 50.0 per cent in solid storage and 50.0 per cent in dry lot (but in CRF table 4.B(a) Bulgaria has reported 65.0 per cent in solid storage and 35.0 per cent in dry lot). In response to a question raised by the ERT during the review, Bulgaria confirmed that for poultry manure, 50.0 per cent is allocated to solid storage and 50.0 per cent to dry lot. Bulgaria explained that these changes were due to the implementation of the results of a project for poultry manure characteristics and handling from the Agricultural University of Plovdiv. Bulgaria provided the spreadsheet confirming these changes and the estimated impacts on emissions from these changes. The ERT welcomes these improvements, but recommends that Bulgaria improve its QA/QC procedures to reduce the inconsistency between the NIR and the CRF tables, and to include detailed information in the NIR.

66. The values for VS for cattle and sheep were estimated using equation 4.16 from the IPCC good practice guidance. For all other animal categories the IPCC default values were used. Given that swine and poultry are significant subcategories, it was recommended in the previous review report that Bulgaria generate appropriate and country-specific values of VS for these animal types. In the 2013 annual submission, IPCC default values are still used. In response to a question raised by the ERT during the review, Bulgaria explained that at present, various literature sources are being reviewed to see whether there are data available from scientific studies. Pending the results of this review, there will be either a detailed explanation of the existing calculations or a project to develop country-specific values for VS for the 2014 annual submission. The ERT recommends that Bulgaria report on progress on the review of the VS estimates in the NIR.

Indirect soil emissions – N_2O

67. Bulgaria has estimated indirect N_2O emissions from atmospheric deposition and nitrogen leaching and runoff using the IPCC tier 1a method and default IPCC EFs and parameters. However, as indicated in the previous review report, more detailed data on ammonia volatilization are available from Bulgaria's submission under the Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe (UNECE). In order to improve the accuracy of emission estimates from ammonia volatilization and the consistency of reporting between the UNFCCC and UNECE, the ERT reiterates the recommendations made in the previous review report that Bulgaria use country-specific parameters to estimate N_2O emissions from ammonia volatilization and report them under the indirect soil emissions category.

3. Non-key categories

Rice cultivation – CH_4

68. The CH_4 IEF (40.00 g/m^2) for continuously flooded, irrigated rice cultivation is among the highest of reporting Parties (ranging from 12.00 to 69.13 g/m^2 in 2011) and is higher than the IPCC default range of 12–28 g/m^2. This high EF is due to the fact that Bulgaria applied a tier 1 method, using the standard EF (20 g/m^2) provided in table 4.22 of the IPCC good practice guidance multiplied by the scaling factor of 2 for organic amendment. Based on the tier 1 method, this use of the scaling factor for organic amendment implies that the organic application rate in Bulgaria is between 1.5 and 3.5 t/ha. For more accurate estimates, the ERT encourages the Party to check whether this is consistent with the organic amendment practice in the country. Preferably, methane flux should be directly measured to develop a more accurate country-specific EF.

Field burning of agricultural residues – CH_4 and N_2O

69. Bulgaria does not use the values from the IPCC good practice guidance for the N/C ratio for estimating emissions from agricultural field burning. The N/C ratios of wheat (0.012 in CRF table 4.F versus 0.006 in the IPCC good practice guidance), barley (0.012 versus 0.009), rice (0.16 versus 0.016) and sunflowers (0.033 versus 0.017) used for calculation in CRF table 4.F are different from the values given in NIR table 180, which are the default values from the IPCC good practice guidance. The ERT recommends that Bulgaria either provide a justification for the values used in the CRF tables or correct these values using the IPCC good practice guidance default values.

E. Land use, land-use change and forestry

1. Sector overview

70. In 2011, net removals from the LULUCF sector amounted to 7,979.42 Gg CO_2 eq. Since 1988, net removals have decreased by 44.4 per cent. The key driver for the fall in removals is the decline in the rate of forest growth as the average age of the forest estate steadily increases (see para. 80 below). Within the sector, forest land and grassland were responsible for net removals (10,250.84 Gg CO_2 and 786.64 Gg CO_2 respectively), while cropland, settlements and wetlands were sources of emissions (2,322.47 Gg CO_2, 523.16 Gg CO_2 and 212.42 Gg CO_2 respectively).

71. Bulgaria does not have AD for the categories forest land converted to wetlands and forest land converted to settlements in the period 1990–1999 (see NIR, page 205 and table 207). To overcome this limitation, a method has been developed to estimate the area of forest land converted to settlements in the period 1990–1999 for inclusion in the inventory, while forest land converted to wetlands is ignored during this period. Similarly, in the classification land converted to cropland, Bulgaria has estimated the AD for the period 1990–1999 (NIR table 197). In all of these cases the resulting estimates of emissions in these classifications show a sharp change in 2000 followed by a steady rise in emissions. After reviewing this information in the NIR (see paras 76 and 77 below), the ERT concluded that this sharp change in emissions in 2000 was not due to human activity but is an artefact of the methodology used to estimate the historical time series. The ERT strongly recommends that the Party develop a consistent time series for emissions in these classifications using the methods as described in chapter 5 of the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

72. As noted in a recommendation made in the previous review report, the classification forest land remaining forest land provides steady net removals of CO_2 emissions throughout

the time series and the same was observed in the 2013 annual submission. On page 336 of the NIR Bulgaria notes that "a permanent trend in increasing the volume stock in Bulgarian forest is observed". While this ongoing increase in carbon stocks provides an ongoing source of removals in the forest land remaining forest land classification, the increase in carbon stocks is not consistently applied to the forest land converted to other land uses classifications. As a result, emissions in these classifications are likely to be underestimated. This same issue is likely to apply to the forest land converted to settlements classification; however, information was not provided in the NIR to verify if this were the case (see para. 78 below). The ERT strongly recommends that the biomass data that are available through Bulgaria's national forest inventory (NFI) be applied consistently to all land-use categories.

2. Key categories

Forest land remaining forest land – CO_2

73. Bulgaria has reported continuous net removals in this category over the entire time series 1988–2011 (ranging from 13,789.55 Gg CO_2 in 1992 to 9,764.27 Gg CO_2 eq in 2007, NIR table 187) but they have generally stabilized in the past six years. In response to questions raised by the ERT during the review as to why net removals have stabilized and not continued to fall, Bulgaria explained that estimates of carbon stock change within this classification are based on reporting form 3, tree biomass stock, which is updated every five years. Hence, the figures for carbon stock change remain constant for a five-year period, and in the estimates of the biomass stock Bulgaria has used the data for the years 1990, 1995, 2000, 2005 and 2010. The stock changes of the wood volumes were obtained by estimating the difference between the periods divided by five. The last NFI data are from 2010. The biomass stock for the years after 2005 have been estimated based on NFI data from 2010. This explanation allayed the concerns of the ERT. The ERT recommends that Bulgaria provide a detailed description of its inventory method in its NIR.

74. Bulgaria applied a tier 1 method for carbon stock change in dead organic matter and soil pools for this category. In order to justify use of the tier 1 method, Bulgaria reported in its NIR that data on average carbon stocks in mineral soils in forests show a decrease in carbon stocks in forest soils, which is not statistically significant, between the average of the period 1986–1997 (54.56 t C/ha) to the average of the period 1998–2008 (51.89 t C/ha). As forest land remaining forest land is a key category, Bulgaria should apply a higher-tier method for these estimations. The ERT recommends that Bulgaria apply a higher-tier method in estimating emissions and removals in the dead organic matter and soil carbon pools.

Cropland remaining cropland – CO_2

75. The CO_2 IEF in this category show a high level of inter-annual variability (ranging from 0.009 Mg CO_2/ha to 0.378 Mg CO_2/ha). In response to a question raised by the ERT during the review, Bulgaria replied that it uses country-specific and default factors for annual growth in annual and perennial crops. The Party further explained that one of the possible reasons for the variation is that Bulgaria has also reported changes in carbon stock within the cropland category (e.g. change from perennial to annual crops, annual crops to perennials and perennials remaining perennials). The ERT was satisfied with this explanation and recommends that the Party include this information in the NIR to improve transparency.

Land converted to cropland – CO_2

76. The trend in emissions in this category appears not to be time-series consistent. Emissions are constant in the period 1990–1999 (508.53 Gg CO_2), rise sharply in 2000 (640.67 Gg CO_2), followed by an upward trend through to the current inventory year

(855.36 Gg CO_2). The area of land included in the land converted to cropland classification is included in table 197 of the NIR, which shows the area as constant from 1988 to 1999 and then increasing from 2000 to 2011. The large inter-annual variability between 1999 and 2000 (26.0 per cent increase in emissions) is purely an artefact of time-series inconsistency in the AD used to estimate emissions from this classification (it does not reflect a sharp change in human-induced emissions from this classification) (see para. 71 above). The ERT strongly recommends that the Party develop a consistent time series for emissions using the methods as described in chapter 5 of the IPCC good practice guidance for LULUCF.

Land converted to settlements – CO_2

77. The trend in emissions in the classification land converted to settlements appears not to be time-series consistent. Emissions are constant in the period 1990–1999 (83.17 Gg CO_2) and then rise sharply in 2001 and 2002 (98.13 Gg CO_2 and 129.95 Gg CO_2, respectively) which is followed by an upward trend from then to the current inventory year (523.16 Gg CO_2). The sharp change reported in 2001 and 2002 is purely an artefact of the method (it does not reflect a sharp change in human-induced emissions from this classification). In the period when AD are available emissions are estimated by the Party to be higher than during the period when AD are not available (see para. 71 above). The ERT strongly recommends that the Party develop a consistent time series for emissions using the methods as described in chapter 5 of the IPCC good practice guidance for LULUCF.

78. In section 7.6.3.1.1 of the NIR, Bulgaria has described the methods used to estimate emissions associated with forest land converted to settlements. This section refers to chapter 7.2 of the NIR for the methodology and the data for the forests. Section 7.6.3.1.1 does not provide the mass of living forest biomass needed in order to estimate emissions from forest land converted to settlements. This parameter is not reported in chapter 7.2 either. The ERT notes that the mass of living biomass in forests is reported in section 7.5.3.1.1 (forest land converted to wetlands) and section 11.3.1.2 (methods for Article 3, paragraph 3, of the Kyoto Protocol). To support the continued transparency of the Bulgarian inventory, the ERT strongly recommends that Bulgaria specifically report the living biomass parameter applied to estimate emissions due to the conversion of forest land to settlements in the NIR.

3. Non-key categories

Land converted to wetlands – CO_2

79. Bulgaria has reported "NA" (not applicable) for the years 1990–2000 for net CO_2 emissions and removals from this category. From 2001 onwards, Bulgaria has reported net emissions for land converted to wetlands. As stated on page 364 of the NIR, the Party does have AD for changes in the area of wetlands prior to 2001 but has not applied them. In response to a question raised by the ERT during the review, the Party responded that it estimated that the rate of conversion of forest land to wetlands in the period 1990–2000 was only 20 hectares per year. The ERT does not agree with this approach. Even if AD are relatively low, emissions due to an activity cannot be excluded from the inventory. The ERT strongly recommends that Bulgaria estimate the emissions due to forest land converted to wetlands throughout the entire time series.

80. On page 365 of the NIR, Bulgaria has provided the parameter for living forest biomass (all above-ground and below-ground living tree components) (48.9 t C/ha) which is used to calculate emissions associated with the conversion of forest land to wetlands. In response to a question raised by the ERT during the review, Bulgaria provided a time series of biomass data from coniferous and deciduous forested land showing that the average biomass of forest in Bulgaria is increasing over time from 36 t C/ha in 1990 to 69 t C/ha in 2010 for coniferous forested land, and from 38 t C/ha in 1990 to 50 t C/ha in 2010 for

deciduous forested land. Compared with these data, the application of an average default value of 48.9 t C/ha will result in an overestimation of emissions due to forest land converted to wetlands during the 1990s and an underestimation of emissions from 2000 to the current inventory year. The ERT strongly recommends that the Party apply this country-specific time series of forest biomass in order to avoid an underestimation of emissions.

F. Waste

1. Sector overview

81. In 2011, emissions from the waste sector amounted to 3,761.83 Gg CO_2 eq, or 5.7 per cent of total GHG emissions. Since 1988, emissions have decreased by 35.0 per cent. Emissions have decreased in almost all categories: most importantly in wastewater handling (by 66.6 per cent mainly due to decreased industrial wastewater output) and waste incineration (by 49.8 per cent caused by closure of many small incinerators). Within the sector, 77.1 per cent of the emissions were from solid waste disposal on land, followed by 22.2 per cent from wastewater handling, with composting and waste incineration accounting for slightly less than 0.4 per cent each.

82. The ERT noted some inconsistencies in the NIR: for example, the base year emissions are reported differently in the NIR and the CRF tables (5,758.08 Gg CO_2 eq on page 379 of the NIR versus 5,789.11 Gg CO_2 eq in the CRF tables); table headings make incorrect references to biochemical oxygen demand values in the case of industrial wastewater; no specific recalculations are reported in the wastewater handling category in the NIR whereas estimates were changed for 2010 in the CRF tables (by –8.03 Gg CH_4, or –1.1 per cent); and the European Union (EU) landfill directive is referenced under three different numbers (1999/31/EC, 199/31/EC and 1993/31/EC). Consequently, the ERT recommends that Bulgaria enhance its QA/QC activities before its official submission.

2. Key categories

Solid waste disposal on land – CH_4

83. In line with the IPCC good practice guidance, Bulgaria has applied the first-order decay method. For the 2013 annual submission, following a recommendation made in the ESD technical review, the Party has reassessed the AD, that is, the amount of disposed waste, for the years prior to 1999 with the assumption that the generated waste is proportional to population. The ERT agrees that this is in line with the IPCC good practice guidance, and recommends that Bulgaria include the rationale of choosing population as proxy data in the NIR. As disposed waste can lead to CH_4 emissions for decades, changes in the AD of previous years have an effect on recent emission levels; for example, the new emission estimates are lower by 22.7 per cent and 26.6 per cent in 2010 and in the base year, respectively. Since the calculation method requires data for years well before the base year, the ERT recommends that Bulgaria also include the data and parameters used for some years of the period 1950–1987 to increase transparency.

84. In previous review reports it was recommended that Bulgaria include in its NIR information on industrial waste disposal (e.g. composition). However, the ERT noted that no information on this issue has been included in the NIR of the 2013 annual submission. Comparisons with international statistics (e.g. Eurostat data on treatment of waste) indicate a somewhat higher level of disposal in the international statistics, including additional wood and other degradable vegetal wastes, in addition to mixed ordinary waste. Based on available statistics from Eurostat for 2010, besides the 3,043 Gg of household and similar wastes that roughly corresponds with the 3,041 Gg reported by Bulgaria as annual municipal solid waste at the solid waste disposal site for 2010, 9 Gg of paper and cardboard

wastes, 8 Gg of wood wastes and 150 Gg of vegetal wastes were deposited onto or into landfills. In response to questions raised by the ERT during the review, Bulgaria explained that not all waste accepted in landfill sites undergoes the process of landfilling but some is treated in other ways, which might be the cause of discrepancies in the different statistics. Still, as the ERT considers that the issue of industrial waste disposal is not addressed transparently enough in the NIR, it strongly recommends that Bulgaria include information on the amount, composition and treatment of industrial waste.

85. Based on information in the NIR, CH_4 recovery was calculated for the years 2010 and 2011. The calculated values show good agreement with energy statistics. In response to a question raised by the ERT during the review regarding the calculation method, Bulgaria explained that the calculation of CH_4 recovery from landfills is based on questionnaires responded to by landfill operators, which contain data on metered volumes of total captured CH_4 for flaring and utilization for power generation. These CH_4 volumes are then converted to mass units using a CH_4 density value. The ERT commends Bulgaria for its efforts to collect this information and recommends that the Party include this information in the NIR.

86. The ERT noted that the fraction of disposed waste changed quite significantly between 77.5 per cent and 98.4 per cent in the period 2005–2011, and decreased from 98.4 per cent in 2010 to 93.3 per cent in 2011. In response to questions raised by the ERT during the review, Bulgaria provided additional information, and explained that the reason for the reduction in disposed waste is increased recycling of different types of waste (e.g. plastics, metals, glass, wood). The ERT recommends that Bulgaria include an overall description of the development of different waste treatment practices in the country in the NIR.

Wastewater handling – CH_4

87. For domestic and commercial wastewater, Bulgaria has applied the default methodology provided by the Revised 1996 IPCC Guidelines. The Party defined three different pathways where CH_4 emissions could occur and selected different methane correction factors for these. However, no information is provided in the NIR on the share of the different treatment pathways that would allow assessment of the calculations. In response to questions raised by the ERT during the review, Bulgaria provided its calculation spreadsheet that contained the necessary information on how it derived the weighted average of the methane correction factors. The ERT recommends that the Party include in the NIR information on the share of the different wastewater treatment systems with the descriptions of the main trends.

88. In 2011, the CH_4 IEF for sludge from domestic and commercial wastewater for Bulgaria (0.64 kg/kg degradable organic carbon (DOC)) is the highest among reporting Parties (ranging from 0.01 to 0.64 kg/kg DOC). At the same time, Bulgaria has reported "NO" for CH_4 recovery. However, energy statistics from Eurostat indicate the production of 124 TJ of sewage sludge gas, and the energy chapter of the NIR makes reference to sludge gas consumption (e.g. NIR tables 30 and 31). In response to questions raised by the ERT during the review, Bulgaria provided a spreadsheet, from which the ERT concluded that CH_4 recovery does occur (estimated at 6.25 Gg CH_4) and was incorrectly reported as "NO" in CRF table 6.B. The ERT recommends therefore that Bulgaria include detailed information in the NIR on how recovered CH_4 was quantified, report CH_4 recovery in the CRF tables and recalculate the resulting emissions if necessary. The ERT also noted that Bulgaria has applied a relatively high country-specific value for maximum methane producing capacity (B_o) for the emission estimates from sludge treatment without any explanation in the NIR. The ERT recommends that the Party provide background information on different domestic sludge treatment practices and include a justification of using a much higher value for B_o than the default.

3. Non-key categories

Wastewater handling – N_2O

89. Bulgaria has reported N_2O emissions from sludge spreading on agricultural soils under agricultural soils, subcategory other direct emissions (direct soil emissions), which can be considered as good practice. However, it is not transparently described in the NIR whether or not the N input applied to agricultural soils is excluded from reporting in the waste sector. Therefore the ERT recommends that Bulgaria investigate this issue of possible double counting and include all relevant information in the NIR.

Waste incineration – CO_2, CH_4, N_2O

90. Overall GHG emissions from waste incineration decreased significantly between 2004 and 2011 (from 99.19 Gg CO_2 eq in 2004 to 13.30 Gg CO_2 eq in 2011, or an 86.6 per cent decline). In response to questions raised in previous reviews, Bulgaria explained that this reduction is caused by more stringent domestic environmental legislation (EU directive 2000/76/EC transposed into regulation no. 6/28.04.2004) that has led to the closure of many incinerators, but this information is still missing from the NIR. The ERT reiterates the recommendation made in the previous review report that the Party include this explanation in the NIR to ensure that all estimates can be reviewed and verified. The ERT also noted that Bulgaria reports "NO" for biogenic waste incineration. For the calculation of non-biogenic CO_2 emissions from clinical and hazardous waste, a default fossil carbon content is applied, that is, 40 per cent of total carbon in the case of clinical waste. The ERT recommends that Bulgaria also report the remaining biogenic part and the corresponding CO_2 emissions as a memo item.

Other (waste) – CH_4, N_2O

91. Bulgaria has reported emissions from composting for the first time in the 2013 annual submission. The ERT commends Bulgaria for this development. However, the ERT also noted that the NIR does not contain any information on the amount of waste composted. The ERT recommends that Bulgaria include the AD in the NIR to increase transparency of its reporting.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

92. Table 6 provides an overview of the information reported and parameters selected by Bulgaria under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

	Findings and recommendations
Has Bulgaria reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Sufficient
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: None Years reported: None

Findings and recommendations

Identify the period of accounting	Commitment period accounting
Assessment of Bulgaria's ability to identify areas of land and areas of land-use change	Sufficient

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

93. In table NIR-1, Bulgaria has used the notation key "NR" (not reported) for the dead wood pool; however, in table 5(KP-I) A.1.1 the notation key "NO" is reported for the same pool. In response to questions raised by the ERT during the review, Bulgaria indicated that the correct notation key is "NO". The ERT recommends that the Party apply notation keys consistently for this pool.

94. In the NIR, Bulgaria provides a justification that afforestation/reforestation is directly human induced on the basis of a law enacted in 2011. In response to questions raised by the ERT during the review, Bulgaria explained that this law was only an improvement of an existing law which limited clearing on naturally regrown forests. The IPCC good practice guidance for LULUCF provides a non-exhaustive list of examples on how to document that afforestation/reforestation is directly human induced. The conclusions of the eighth meeting of inventory lead reviewers[6] confirm that an ERT may be satisfied with such a rationale, or "may request further information". In the experience of the ERT, the rationale currently provided by Parties that natural regeneration of forest qualifies as directly human induced falls into two broad categories:

(a) Managed land – if land use prior to natural forest regrowth was cropland or managed grassland, this natural regrowth can be considered as directly human induced. The nature of the driver for the decision – for example, whether due to economic circumstances (such as a decline in commodity prices) or a goal relating to biodiversity enhancement – provides a context, but in any case a decision has been made to reduce the area of managed land under production. This leaves as non-directly human-induced afforestation/ reforestation:

(i) Forest regrowth occurring on unmanaged land (by definition not managed);

(ii) Forest regrowth on land classified as other land;

(b) Regulation of forest clearing – if there is a regulatory framework which hinders forest clearing of naturally regrowing forests, this natural regrowth can be considered as directly human induced. In the experience of the ERT, there are regulatory frameworks in many countries which result in the limitation of forest clearing by law. In the case of naturally regrowing forest, there is the potential that without a deliberate decision to suppress the natural regrowth of the forest the land will become subject to forest protection regulations. The effect of this land being subject to forest protection regulations is to effectively reduce the area of land under agricultural production (because once it is a forest the possibility of clearing it again for agricultural purposes is restricted and subject to an administrative process). The corollary of this situation is that the regrowth of this forest is the result of a deliberate decision to reduce the area of land under production.

95. In the case of Bulgaria, all of the elements of the "managed land" rationale outlined above have been met:

[6] <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/review_process/application/pdf/con_rec.8.pdf>.

(a) It is stated in the NIR that "all forests in Bulgaria are managed";

(b) A total of 99.3 per cent of afforestation/reforestation occurs on former cropland or managed grassland (0.7 per cent on other land).

96. In addition, in response to several questions raised by the ERT during the review, Bulgaria clarified the regulatory framework which limits the clearing of forest in Bulgaria. This regulatory framework has the effect of limiting the clearing of naturally regrowing forests. In the case of Bulgaria, all of the elements of the "regulation of forest clearing" rationale outlined above have been met.

97. Based on these criteria, the ERT is of the view that the direct human-induced nature of land included in afforestation/reforestation is properly documented. Noting this overall conclusion, the ERT makes the following strong recommendations:

(a) That Bulgaria exclude a small area of forest (0.7 per cent of land within the afforestation/reforestation classification) which naturally regrew on other lands. The ERT strongly recommends that afforestation/reforestation on these lands be excluded;

(b) That Bulgaria include information in the NIR regarding all relevant legislation in force since 1990 to demonstrate that naturally regrowing forests are subject to a regulatory framework (e.g. using an abstract of the material supplied to the ERT during the review for both the current and the former forest acts).

Deforestation – CO_2

98. Related to the identification of naturally regrowing forests under afforestation/reforestation, Bulgaria indicated in its NIR and in response to questions raised by the ERT during the review that under some circumstances following an application and approval process land managers may clear naturally regrowing forests. The ERT was concerned as to whether these activities were specifically identified as deforestation. In response to a question raised by the ERT during the review, Bulgaria responded that the "Forest Act (both the old and the new one) clearly inscribes all cases in which forest is taken out of the Forest Fund (existing woods). This is followed by land-use change and they are transformed from forested to non-forested lands. The procedure for taking out of the Forest Fund is given in the Forest Act. Therefore all changes in the function or designation of the forests are considered as deforestation and are reported as such." The ERT welcomes the Party's clarification and encourages it to improve the transparency of the description of deforestation activities in the NIR to ensure that it is clear that, where a land manager is granted the ability to clear a forest, the emissions associated with this activity are reported under deforestation.

99. Bulgaria uses the parameter for living forest biomass (all above-ground and below-ground living tree components) of 48.9 t C/ha to calculate emissions associated with deforestation. The ERT notes that data provided by Bulgaria in response to a question raised by the ERT during the review (see para. 80 above) indicates that actual data available to the Party suggest that application of an average default value of 48.9 t C/ha will result in an underestimation of emissions from deforestation during the first commitment period. The ERT strongly recommends that the Party use the data from 2005 and 2010 to estimate deforestation emissions in order to avoid an underestimation of emissions from this activity.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

100. Bulgaria has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note

of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[7] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10.

101. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Calculation of the commitment period reserve

102. Bulgaria has reported its commitment period reserve in its 2013 annual submission. It reported its commitment period reserve to be 330,666,405 t CO_2 eq based on the national emissions in its most recent inventory (66,133.29 Gg CO_2 eq for inventory year 2011). This calculation is incorrect, because it should have been based on the most recently reviewed inventory submission, which at the time of the 2013 annual submission would have been the final values from the 2011 annual submission. The ERT notes that, based on the submission of revised emission estimates by Bulgaria during the course of the review of the 2013 annual submission, the commitment period reserve for Bulgaria changed, and the new commitment period reserve is reported as 330,666,473 t CO_2 eq. The ERT agrees with this figure.

3. Changes to the national system

103. Bulgaria reported that there are no changes in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

104. Bulgaria reported that there are changes in its national registry since the previous annual submission. The Party described the changes, specifically due to the centralization of the EU ETS operations into a single EU registry operated by the European Commission called the Consolidated System of EU registries (CSEUR), in its NIR (see page. 474). The CSEUR is a consolidated platform which implements the national registries in a consolidated manner and was developed together with the new EU registry.

105. The ERT noted that there were recommendations in the SIAR that had not been addressed related to the CSEUR, in particular recommendations related to public availability of information on the website, reporting a description of the changes in database structure and reporting of test results.

106. Specifically, with regard to the requirements regarding the public availability of information in accordance with section II.E of the annex to decision 13/CMP.1, the SIAR report listed several shortcomings concerning the following issues:

(a) The lack of a time stamp for the account information (SIAR, part I, ref. no. P1.4.1);

[7] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

(b) The lack of information on emission reduction unit (ERU) issuance before 2012 (SIAR, part I, ref. no. P1.4.1);

(c) The non-availability of non-confidential information on holdings and transactions (SIAR, part I, ref. no. P1.4.3);

(d) The identification of legal entities authorized by the Party and all the years in which ERUs have been issued (SIAR, part II, recommendation 7).

107. In response to questions raised by the ERT during the review, Bulgaria provided further information on the changes to the national registry, including on public availability of information on the website, reporting a description of the changes in database structure and reporting of test results.

108. The ERT concluded that, taking into account the confirmed changes in the national registry, including additional information provided to the ERT during the review, Bulgaria's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). With respect to the provision of information related to database structure specifically, the ERT encourages the Party to provide additional information in the NIR. The ERT recommends that Bulgaria include all other additional information in response to the SIAR findings in its NIR in accordance with decision 15/CMP.1, annex, chapter I.G.

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

109. Bulgaria did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, in its annual submission. The ERT noted that the reported information in the 2013 annual submission is identical to that reported in the 2010, 2011 and 2012 annual submissions. The ERT concluded that the information provided continues to be complete and transparent. The ERT recommends that Bulgaria, in its annual submission, report clearly whether it introduced any changes in its information provided under Article 3, paragraph 14, of the Kyoto Protocol, in accordance with chapter I.H of the annex to decision 15/CMP.1.

110. Bulgaria has developed a number of legislative measures that are connected mainly with the transposing of the corresponding EU legislation and the reduction or phasing out of market imperfections. The Party also carries out other activities in implementing directives connected with the policies on climate change. The effects of national legislation, such as the Environmental Protection Act and Clean Air Act, the Energy Act, the Renewable Energy Sources Act, the Energy Efficiency Law and the Law on Waste Management are presented in table 247 of the NIR.

III. Conclusions and recommendations

A. Conclusions

111. Table 7 summarizes the ERT's conclusions on the 2013 annual submission of Bulgaria, in accordance with the Article 8 review guidelines.

Table 7
Expert review team's conclusions on the 2013 annual submission of Bulgaria

		Paragraph cross-references
The ERT concludes that the inventory submission of Bulgaria is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1988–2011)		
Annex A sources[a]	Complete	
LULUCF[b]	Complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Bulgaria has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	44, 49
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
Bulgaria's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Yes	
Bulgaria has reported information on Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Yes	See paragraph 97 (afforestation/reforestation area) and paragraph 99 (use of data from 2005 and 2010 for estimating emissions from deforestation)
Bulgaria has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Bulgaria provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	No	Bulgaria did not indicate whether a change occurred, but reported on the minimization of adverse impacts, which was the same information as in the previous annual submission

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

112. The ERT identified the issues for improvement listed in table 8. All recommendations are for the next annual submission, unless otherwise specified.

Table 8
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
Cross-cutting	Recalculations and time-series consistency	Report consistent and complete information on recalculations in chapter 10 of the NIR and also complete CRF table 8(b) for all recalculations	Table 3
	Quality assurance/ quality control (QA/QC)	Describe any improvements and recalculations arising from category-specific QA checks	Table 3
		Enhance the QC checks that assess the consistency of information between the CRF tables and the NIR	Table 3
	Institutional arrangements	Provide additional information on the roles of large industrial plants and business associations in the description of the national system	12
	Uncertainty	Check the AD uncertainties currently assumed in the estimation (e.g. by comparing with some other countries, and revise the assumed uncertainties, as appropriate)	Table 4
Energy	Comparison of the reference and sectoral approach	Include a quantitative explanation of the differences between the two approaches in the NIR	23
		Include the correction to exclude fuel quantities used for non-energy uses and feedstocks from apparent consumption and describe the impact of this change on the differences between the sectoral and the reference approaches	24
	Feedstocks and non-energy use of fuels	Correct the error in reporting the quantity of non-energy use of natural gas that occurred when entering data into the CRF Reporter in the 2013 annual submission	26

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	Stationary combustion: liquid fuels– CO_2, CH_4 and N_2O	Reallocate the AD and emissions from residual fuel oil in the railways subcategory to the category commercial/institutional for the entire time series	28
		Change the notation key for liquid fuels under other (energy – mobile) from "NO" to "IE" and report in the NIR that emissions from military activities are treated as domestic and included in road transportation and civil aviation	29
	Road transportation: gasoline, diesel, LPG – CO_2	Correct the AD to reflect country-specific NCVs and explain in the NIR any differences between fuel consumption reported in the CRF tables and in the energy balance	31
		Investigate whether the default hydrogen/carbon and oxygen/carbon ratios are suitable for Bulgaria and recalculate the split between leaded and unleaded gasoline consumption	32
		Investigate the country-specific parameters concerning the car fleet and vehicle split and implement them in the COPERT model	33
	Coal mining and handling: solid fuels – CH_4	Include the use of a higher-tier method for coal mining and handling in the improvement plan and implement this improvement in a future annual submission	34
		Include further information in the NIR about whether and when an assessment of resources would allow the Party to move to a higher-tier method for a future annual submission.	34
	Oil and natural gas: liquid fuels – CO_2 and CH_4	Include a methodological description of this category in the NIR	35
	Stationary combustion: other fuels – CH_4 and N_2O	Split the AD for other fuels into a biomass fraction (allocated under biomass) and a fossil fraction (allocated under other fuels)	36
Industrial processes and solvent and other product use	Sector overview	Revise the chapter in the NIR to ensure that it provides the level of information necessary to understand the basis and rationale behind the emission estimates	39
		Strengthen QC activities to ensure that information included in the NIR is consistent with data reported in the CRF tables and review, and as appropriate revise, the usage of notation keys	40

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	Lime production – CO_2	Provide the method and source used for estimating the ratio between quicklime and dolomitic lime production in the NIR	41
	Other (mineral products) – CO_2	Determine whether the average IEF from the newly available data from the EU ETS for the period 2009–2011 would be a more accurate reflection of emissions prior to 2008, and if so, recalculate the country-specific EF using the newly available data and apply the revised country-specific EF to the entire time series of 1988–2007	43
	Ammonia production	Clearly explain in the NIR that it uses the equation for CO_2 emissions estimation from the Revised 1996 IPCC Guidelines and does not deduct the CO_2 used for urea production	44
	Iron and steel production – CO_2	Document the data and the methodologies used for the calculation of the country-specific EF for BOFs in the NIR, including a carbon balance	45
		Use the notation key "IE" for pig iron production and coke production	46
	Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6	Correct the calculation method of HFC emissions from refrigeration and air-conditioning system disposal by deducting the gas losses during the lifetime of the systems	49
		Include a more detailed description for the calculation of actual emissions from foam blowing in the NIR	50
		Account for the imported and exported foams	50
		Include information on the methodology, parameters and assumptions used for the calculation of actual and potential emissions of SF_6 from its use as an insulating medium in electrical equipment in the NIR	51
	Carbide production – CO_2	Investigate the quantity of anthracite used as a reducing agent in carbide production and deduct these emissions from the energy sector	52
	Other (chemical industry) – CH_4	Include information in the NIR for this category on data sources, EFs and associated parameters, methods and assumptions to ensure that all estimates can be independently verified	53
Agriculture	Sector overview	Provide information in the NIR on the rationales for any recalculations and the specific methodology or parameters used in the recalculations	56
		Pay more attention to the QA/QC procedures and demonstrate improved consistency and accuracy of the	59

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
		GHG emissions inventory for the agriculture sector	
	Enteric fermentation – CH_4	Provide detailed information on how emissions are calculated for young cattle	60
		Justify the use of a methane conversion factor of 90 per cent and make efforts to develop a country-specific value	61
	Manure management – CH_4 and N_2O	Provide details in the NIR on how and when manure production is measured and the associated uncertainty values	62
		Verify and document the country-specific manure Nex values used in the inventory with well-documented and detailed values, including analysis of manure production, dry matter content, VS content and N content for a number of animals housed in different stable types and with different productivity (e.g. high milk-producing, low milk-producing and dry cows) and for all cattle categories. If this is not possible, use the default Western European Nex value of 100 kg N/dairy cow/day	63
		Further investigate manure production from pigs and subsequently the Nex values for pigs	64
		Improve QA/QC procedures to reduce the inconsistency between the NIR and the CRF tables regarding the allocation of manure by animal waste management system for poultry	65
		Report in the NIR on progress on the review of the VS estimates	66
	Indirect soil emissions – N_2O	Use country-specific parameters to estimate N_2O emissions from ammonia volatilization and report them under the indirect soil emissions category	67
		Either provide a justification for the nitrogen-carbon values used in the CRF tables or correct these values to use the IPCC good practice guidance default values	69
LULUCF	Sector overview	Develop a consistent time series for emissions from forest land converted to wetlands and forest land converted to settlements using the methods as described in chapter 5 of the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)	71
		Apply biomass data that are available through Bulgaria's national forest inventory to all land-use categories	72
	Forest land remaining	Provide a detailed description of the inventory method	73

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	forest land – CO_2		
		Apply a higher-tier method in estimating emissions and removals in dead organic matter and soil carbon pools	74
	Cropland remaining cropland – CO_2	Include information on the inter-annual variability in emissions in the NIR	75
	Land converted to cropland – CO_2	Develop a consistent time series for emissions using the methods as described in chapter 5 of the IPCC good practice guidance for LULUCF	76
	Land converted to settlements – CO_2	Develop a consistent time series for emissions using the methods as described in chapter 5 of the IPCC good practice guidance for LULUCF	77
		Report the living biomass parameter applied to estimate emissions due to the conversion of forest land to settlements	78
	Land converted to wetlands – CO_2	Estimate the emissions due to forest land converted to wetlands throughout the entire time series	79
		Apply the country-specific time series of forest biomass from coniferous and deciduous forested land to avoid an underestimation of emissions	80
Waste	Sector overview	Enhance QA/QC activities before official submission	82
	Solid waste disposal on land – CH_4	Include the rationale of choosing population as proxy data for waste generated in the NIR	83
		Include the data and parameters used for some years of the period 1950–1987	83
		Include information in the NIR on the amount, composition and treatment of industrial waste	84
		Include in the NIR information provided in response to questions raised by the ERT during the review regarding CH_4 recovery, specifically that the calculation of CH_4 recovery from landfills is based on questionnaires responded to by landfill operators, which contain data on metered volumes of total captured CH_4 for flaring and utilization for power generation	85
		Include an overall description of the development of different waste treatment practices in the country in the NIR	86
	Wastewater	Include in the NIR information on the share of the different wastewater treatment systems with the descriptions of the	87

Sector	*Category*	*Recommendation*	*Paragraph cross-reference*
	handling – CH_4	main trends	
		Include detailed information in the NIR on how recovered CH_4 was quantified, report CH_4 recovery in the CRF tables, and recalculate the resulting emissions, if necessary	88
		Provide background information on different domestic sludge treatment practices and include a justification of using a much higher value for CH_4 producing capacity than the default	88
	Wastewater handling – N_2O	Investigate the possible double counting of N_2O emissions from sludge spreading on agricultural soils and N_2O emissions in the waste sector and include all relevant information in the NIR	89
	Waste incineration – CO_2, CH_4 and N_2O	Include an explanation in the NIR regarding the reduction in emissions between 2004 and 2011 due to the introduction of more stringent domestic environmental legislation	90
		Report the remaining biogenic part from clinical and hazardous waste and the corresponding CO_2 emissions as a memo item	90
	Other (waste) – CH_4 and N_2O	Include the AD in the NIR for the amount of waste composted	91
KP-LULUCF	Afforestation/ reforestation – CO_2	Apply notation keys consistently in the CRF tables for the dead wood pool	93
		Exclude afforestation/reforestation on a small area of forest (0.7 per cent of land within the afforestation/reforestation classification) which naturally regrew on other lands	97
		Include information in the NIR regarding all relevant legislation in force since 1990 to demonstrate that naturally regrowing forests are subject to a regulatory framework (e.g. using an abstract of the material supplied to the ERT during the review for both the current and the former forest acts)	97
	Deforestation	Use the data from 2005 and 2010 to estimate deforestation emissions in order to avoid an underestimation of emissions from this activity	99
Changes to the national registry		Include additional information in response to the SIAR findings in its NIR in accordance with decision 15/CMP.1, annex, chapter I.G	108
Article 3, paragraph 14		Report clearly whether changes in information under Article 3, paragraph 14, of the Kyoto Protocol, are introduced	109

Abbreviations: AD = activity data, BOF = basic oxygen furnace, CRF = common reporting format, EF = emission factor, EU ETS = European Union emissions trading system, IE = included elsewhere, IEF = implied emission factor, LULUCF = land-use, land use change and forestry, N = nitrogen, NCV = net calorific value, Nex = nitrogen excretion, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control, VS = volatile solids.

IV. Questions of implementation

113. No questions of implementation were identified by the ERT during the review.

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 9
Recalculations in the 2013 annual submission for the base year and the most recent year

Greenhouse gas source and sink categories	*1988*	*2010*	*1988*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
1. Energy					
A. Fuel combustion (sectoral approach)	–4 394.16	26.97	–5.2	0.1	Change in methods, corrected errors
1. Energy industries		0.62		0.0	
2. Manufacturing industries and construction	–2 817.99	23.68	–13.8	0.6	
3. Transport	111.96	2.67	1.5	0.0	
4. Other sectors					
5. Other	–1 688.13		–20.6		
B. Fugitive emissions from fuels	0.05	0.01		0.0	
1. Solid fuels					
2. Oil and natural gas	0.05	–0.01	0.0	0.0	
2. Industrial processes	–444.22	–288.93	–3.6	–7.5	Change in AD and method
A. Mineral products		–14.01		–0.6	
B. Chemical industry	–1 225.26	–356.09	–24.4	–34.9	
C. Metal production	781.03	1.24	26.8	2.3	
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6		79.93		28.5	
G. Other					
3. Solvent and other product use		0.13		0.5	Change in AD
4. Agriculture	–626.68	220.32	–3.0	3.4	Change in AD, EF, corrected errors
A. Enteric fermentation	–92.93	–21.50	–2.3	–1.6	
B. Manure management	–469.15	–183.19	–7.6	–13.4	
C. Rice cultivation					
D. Agricultural soils	–64.60	–15.62	–0.6	–0.4	
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					
5. Land use, land-use change and forestry	–162.58	522.23	1.13	–5.9	Not provided in

Greenhouse gas source and sink categories	*1988*	*2010*	*1988*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
					CRF tables
A. Forest land	447.55	602.64	–3.03	–5.5	
B. Cropland	–619.15	–127.31	–53.22	–6.0	
C. Grassland					
D. Wetlands		–0.26		–0.1	
E. Settlements	9.02	47.16	12.17	8.9	
F. Other land					
G. Other					
6. Waste	–1 154.83	–869.26	–17.28	–19.3	Change in AD
A. Solid waste disposal on land	–1 185.87	–861.23	–26.62	–22.67	
B. Wastewater handling	31.04	–8.03	1.39	–1.1	
C. Waste incineration					
D. Other					
7. Other					
Total CO_2 equivalent without LULUCF	–6 619.84	–1 351.66	–5.1	–2.2	
Total CO_2 equivalent with LULUCF	–6 782.42	-829.42	–5.9	–1.6	

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, LULUCF = land use, land-use change and forestry.

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	330 666 405	330 666 473		330 666 473
Annex A emissions for 2011				
CO_2	53 243 420	53 243 420		53 243 420
CH_4	7 682 815	7 682 829		7 682 829
N_2O	4 796 381			4 796 381
HFCs	395 743			395 743
PFCs	49			49
SF_6	14 873			14 873
Total Annex A sources	**66 133 281**	**66 133 295**		**66 133 295**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–962 267			–962 267
3.3 Afforestation and reforestation on harvested land for 2011	NO			NO
3.3 Deforestation for 2011	179 832			179 832
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011				
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation in the base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	47 770 504	47 770 504		47 770 504
CH_4	7 360 533	7 360 548		7 360 548
N_2O	4 847 365			4 847 365
HFCs	360 878			360 878
PFCs	41			41
SF_6	13 069			13 069
Total Annex A sources	**60 352 390**	**60 352 405**		**60 352 405**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–801 357			–801 357
3.3 Afforestation and reforestation on harvested land for 2010	NO			NO
3.3 Deforestation for 2010	214 768			214 768
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010				
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation in the base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	45 453 854	45 453 854		45 453 854
CH_4	7 361 095	7 361 111		7 361 111
N_2O	4 639 858			4 639 858
HFCs	340 364			340 364
PFCs	13			13
SF_6	9 974			9 974
Total Annex A sources	**57 805 159**	**57 805 174**		**57 805 174**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–650 052			–650 052
3.3 Afforestation and reforestation on harvested land for 2009	NO			NO
3.3 Deforestation for 2009	165 298			165 298
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation in the base year				

Abbreviation: NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	53 760 944	53 760 944		53 760 944
CH_4	7 729 030	7 729 044		7 729 044
N_2O	5 128 042			5 128 042
HFCs	315 053			315 053
PFCs	0			0
SF_6	9 600			9 600
Total Annex A sources	66 942 668	66 942 683		66 942 683
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–586 592			–586 592
3.3 Afforestation and reforestation on harvested land for 2008	NO			NO
3.3 Deforestation for 2008	309 967			309 967
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation in the base year				

Abbreviation: NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties includ 1 in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Bulgaria 2013. Available at <http://unfccc.int/resource/docs/2013/asr/bgr.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/BGR. Report of the individual review of the annual submission of Bulgaria submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/bgr.pdf>.

UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Bulgaria

Responses to questions during the review were received from Ms. Detelina Petrova (Executive Environment Agency), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Bulgaria:

Agrostatistics bulletins (2007). No 95. Дейност на кланиците за червени меса и производство на месо в България през 2006 година (Activity of slaughterhouses and meat production).

Agrostatistics bulletins (2008). No 111. Дейност на кланиците за червени меса и производство на месо в България през 2007 година (Activity of slaughterhouses and meat production).

Agrostatistics bulletins (2009). No 126. Дейност на кланиците за червени меса и производство на месо в България през 2008 година (Activity of slaughterhouses and meat production).

Agrostatistics bulletins (2010). No 144. Дейност на кланиците за червени меса и производство на месо в България през 2009 година (Activity of slaughterhouses and meat production).

Agrostatistics bulletins (2011). No 179. Дейност на кланиците за червени меса и производство на месо в България през 2010 година (Activity of slaughterhouses and meat production).

Agrostatistics bulletins (2012). No 192. Дейност на кланиците за червени меса и производство на месо в България през 2011 година (Activity of slaughterhouses and meat production in Bulgaria in 2011).

ЗАКОН за опазване на селскостопанското имущество (Law on Forests, promulgated SG 19/8, March 2011, amended SG. 43/7 Jun 2011

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
BOF	basic oxygen furnace
C	carbon
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
CSEUR	Consolidated System of European Union Registries
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
ESD	effort sharing decision
EU	European Union
EU ETS	EU emissions trading system
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
H	hydrogen
HFCs	hydrofluorocarbons
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LTO	landing/take-off
LULUCF	land use, land-use change and forestry
m^2	square meters
m^3	cubic metre
MCF	methane conversion factor
MDI	metered dose inhalers
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
Nex	nitrogen excretion rate
NCV	net calorific value
NFI	national forest inventory
NIR	national inventory report
NO	not occurring
O	oxygen
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control

SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
UNECE	United Nations Economic Cooperation for Europe
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids